Red Thread™ HP 25

(Product Data)

Applications

- Chemical Processing Liquids
- Food Processing Liquids
- Potable Water
- Cooling Water
- Condensate Return
- Industrial Wastewater
- Mildly Corrosive Liquids
- Crude Oil & Gas
- Produced Water
- Saltwater
- CO_2

Materials and Construction

All pipe is filament wound with continuous strands of glass filaments saturated with amine-cured epoxy thermosetting resin. The pipe wall includes an internal resin-rich corrosion barrier. The pipe is designed in accordance with API 15LR at 200°F (93°C), serviceable up to 210°F (99°C) by applying a derating factor of 0.92 to all component ratings. The pressure rating is 362 psig (25 Bar) for a hydrostatic design life of 20 years per ASTM D2992 Procedure B. For 2-6 in. (50-150 mm) sizes, the matched tapered joining method is used and the pipe is available in random 30 foot (9.14 meter) lengths. For 8-24 in. (200-600 mm) sizes, the matched tapered joining method is used and the pipe is available in random 40 foot (12 meter) lengths. Pipe is supplied with one end belled (integral bell or factory-bonded coupling) and one end tapered.

ASTM D-2996 Classification: RTRP-11AW1-3110 for static design basis.

Joining System

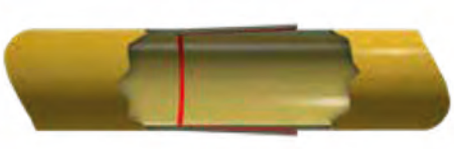
- **T.A.B.™ -** In sizes 2-6 in., pipe and couplings are supplied with a threaded and bonded (T. A. B) joining system. Double-lead threads provide quick secure adhesive connections during installation.
- **Bell & Spigot -** The pipe and fittings are joined using the bell and spigot connection. Pipe is supplied with one end belled (integral bell or factory-bonded coupling) and one end tapered in sizes 8-24 in. For 8-24 in. sizes, the matched tapered joining method is used and the pipe is available in random 12 meter (40 feet) lengths.Epoxy adhesive is used to secure the joint. When properly installed, the system will operate at the maximum pressure rating of the pipe.
- **Flanged -** Flanged connections are available for all components and diameters.

Fittings

Fittings are manufactured with the same chemical/temperature capabilities as the pipe. Depending on the configurations and size, the fittings construction method will be compression molded, contact molded,fabricated or filament wound.

View of Joint Illustrations

T.A.B



Bell & Spigot

Flanged

Nominal Dimensional Data

Pipe Size		Inside Diameter		Outside Diameter[2]		Reinforced Wall Thickness		Weight		Capacity	
in.	mm	in.	mm	in.	mm	in.	mm	lbs/ft	kg/m	gal/ft	l/m
2[1]	50	2.24	57	2.35	60	0.058	1.5	0.4	0.7	0.2	2.5
3[1]	80	3.36	85	3.54	90	0.086	2.2	0.8	1.2	0.5	5.7
4	100	4.36	111	4.53	115	0.083	2.1	1.0	1.5	0.8	9.7
6	150	6.40	163	6.65	169	0.122	3.1	2.2	3.2	1.7	20.9
8	200	8.36	212	8.68	221	0.164	4.2	3.8	5.6	2.9	35.4
10	250	10.36	263	10.76	273	0.203	5.2	5.8	8.7	4.4	54.4
12	300	12.28	312	12.76	324	0.241	6.1	8.2	12.2	6.2	76.4
14	350	14.03	356	14.58	370	0.275	7.0	10.7	15.9	8.0	100.0
16	400	16.03	407	16.66	423	0.314	8.0	13.9	20.7	10.6	130.0
18	450	17.83	453	18.54	471	0.357	9.1	17.6	26.2	13.0	161.0
20	500	19.83	504	20.62	524	0.397	10.1	21.8	32.4	16.0	199.0
24	600	23.83	605	24.78	629	0.477	12.1	31.5	46.9	23.2	288.0

(1) Reinforced wall thickness exceeds the requirement for 362 psig and may be operated up to 435 psig.
(2) Outer diameter is for use in flexibility analysis. Consult factory representative for pipe OD tolerances.
NOTE: System rating is determined by pressure ratings of fittings used in the piping system. See document CI1370 for individual fitting pressure ratings.

Supports

The following engineering analysis must be performed to determine the maximum support spacing for the piping system. Proper pipe support spacing depends on the temperature, pressure and weight of the fluid carried in the pipe. The support spacing is calculated using continuous beam equations and the pipe bending modulus derived from long-term beam bending tests. The following tables were developed to ensure a design that limits beam mid-span deflection to ½ inch to ensure good appearance and adequate drainage. Any additional weight on the piping system such as insulation or heat tracing requires further consideration. Restrained (anchored) piping systems operating at elevated temperatures often result in guide spacing requirements that are more stringent than simple unrestrained piping systems. In this case, the maximum guide spacing will dictate the support/guide spacing requirements for the system. Pipe support spans at changes in direction require special attention. Supported and unsupported fittings. at changes in direction are considered in the following tables and must be followed to properly design the piping system.

Support Spacing vs. Specific Gravity

Specific Gravity	2.00	1.50	1.25	1.00	0.75
Multiplier	0.85	0.91	0.95	1.00	1.06

Maximum Support Spacing for Uninsulated Pipe[1]

Size		Continuous Spans of Pipe[2]			
		feet		meters	
in.	mm	75°F	200°F	24°C	93°C
2	50	13.5	12.0	4.11	3.68
3	80	16.4	14.7	5.02	4.50
4	100	17.5	15.7	5.34	4.79
6	150	21.2	19.0	6.48	5.81
8	200	24.4	21.9	7.45	6.68
10	250	27.2	24.3	8.29	7.43
12	300	29.6	26.5	9.03	8.09
14	350	31.6	28.3	9.65	8.65
16	400	33.8	30.3	10.31	9.25
18	450	35.8	32.1	10.93	9.80
20	500	37.8	33.9	11.53	10.33
24	600	41.4	37.1	12.63	11.33
30	750	45.8	41.1	13.99	12.54

(1) For Sg=1.0, consult manufacturer for heavier insulated pipe support spans. Span recommendations include no provision for weight of (fittings, valves, etc.) or thrusts at branches and turns. Heavy valves and other appurtenances must be supported separately.

(2) Calculated spans are based on ½ in. mid-span deflections to ensure good appearance and adequate drainage. Total system stresses should always be taken into account by the system design engineer when determining support spans.

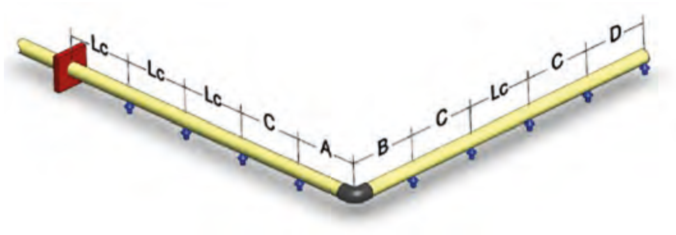
There are seven basic rules to follow when designing piping system supports, anchors, and guides:

1. Do not exceed the recommended support span.
2. Support valves and heavy in-line equipment independently. This applies to both vertical and horizontal piping.
3. Protect pipe from external abrasion.
4. Avoid point contact loads
5. Avoid excessive bending. This applies to handling, transporting, initial layout, and final installed position.
6. Avoid excessive vertical run loading. Vertical loads should be supported sufficiently to minimize bending stresses at outlets or changes in direction.
7. Provide adequate axial and lateral restraint to ensure line stability during rapid changes in flow.

Adjustment Factors for Various Spans with Unsupported Fitting at Change in Direction

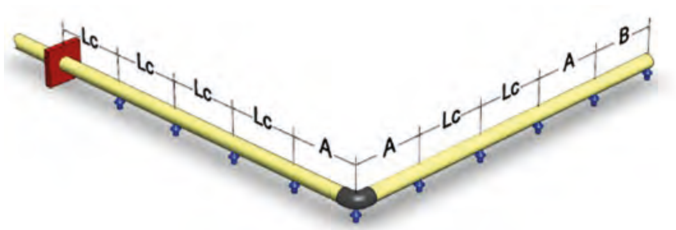
	Span Type	Factor
Lc	Continuous interior or fixed end spans	1.00
C	Second span from supported end or unsupported fitting	0.80
A+B	Sum of unsupported spans at fitting	≤0.75*
D	Simple supported end span	0.67

*For example: If continuous support is 10 ft. (3.04 m), A+B must not exceed 7.5 ft.(2.28 m) (A=3 ft. (0.91 m) and B=4.5 ft. (1.37 m)) would satisfy this condition.



Adjustment Factors for Various Spans with Supported Fitting at Change in Direction

	Span Type	Factor
Lc	Continuous interior or fixed end spans	1.00
A	Second span from simple supported end or unsupported fitting	0.80
B	Simple supported end span	0.67



Thermal Expansion

The effects of thermal gradients on piping systems may be significant and should be considered in every piping system stress analysis. Pipe line movements due to thermal expansion or contraction may cause high stresses or even buckle a pipe line if improperly restrained. Several piping system designs are used to manage thermal expansion and contraction in above ground piping systems. They are listed below according to economic preference:

1. Use of inherent flexibility in directional changes.
2. Restraining axial movements and guiding to prevent buckling.
3. Use expansion loops to absorb thermal movements.
4. Use mechanical expansion joints to absorb thermal movements.

To perform a thermal analysis the following information is required:

1. Isometric layout of piping system
2. Physical and material properties of pipe
3. Design temperatures
4. Installation temperature (Final tie in temperature)
5. Terminal equipment load limits
6. Support movements

A comprehensive review of temperature effects on fiberglass pipe may be found in NOV Fiber Glass Systems' Engineering and Piping Design Guide, Section 3.

Temperature Change		Pipe Length Change	
°F	°C	in./100 ft	cm/100 m
25	13.9	0.36	3.0
50	27.8	0.72	6.0
75	41.7	1.08	9.0
100	55.6	1.44	12.0

Testing

Hydrostatic testing is recommended to evaluate the integrity of all new piping installations. For systems operating below the system rating, a test pressure of 1.5 times the system operating pressure is recommended; however, the maximum test pressure must not exceed 1.3 times the lowest pressure rated fiberglass component in the piping system.

The hydro test pressure should be repeated up to ten cycles from 0 psig to the test pressure to provide a high degree of confidence in the piping system. The final pressurization cycle should be allowed to stabilize for 15-30 minutes, then inspected for leaks. Do not attempt to repair leaks while system is pressurized. The hydro test should be repeated after any re-work is performed.

When hydro testing, open high-point vents (if used) to prevent entrapment of air in the lines as the system is slowly filled with water, then close the vents and slowly pressurize to the test pressure. Upon completion of hydro test, relieve the pressure on the system slowly, open vents and any drains to allow for complete drainage of the system.

Water Hammer

Piping systems may be damaged by pressure surges due to water hammer. The use of soft start pumps and slow actuating valves will reduce the magnitude of surge pressures during operation and are highly recommended.

Typical Mechanical Properties

Pipe Property	70°F psi	21°C MPa	150°F psi	65°C MPa	200°C psi	93°C MPa	Method
Hydrostatic Design Basis							
(LTHS)	23,400[1]	161[1]	23,400	161	17,500	121	ASTM D2992
(LCL)	20,900[1]	144[1]	20,900	144	15,800	109	Proc. B (20 yrs)
Ultimate Hoop Stress at Weeping	36,000	248	45,000	313	48,400	334	ASTM D1599
Circumferential							
Hoop Tensile Modulus	3.84×10^6	26,500	2.86×10^6	19,700	2.25×10^6	15,500	NOV FGS
Poisson's Ratio ν_{ha}	0.61		0.73		0.8		NOV FGS
Longitudinal							
Axial Tensile Strength	11,600	80	10,100	70	9,200	63.4	ASTM D2105
Axial Modulus	2.24×10^6	15,000	1.53×10^6	11,200	1.24×10^6	8,550	ASTM D2105
Poisson's Ratio ν_{ah}	0.35		0.39		0.42		ASTM D2105
Axial Bending Strength	23,000	85	-	-	-	-	NOV FGS
Axial Bending Modulus	2.25×10^6	15,000	1.75×10^6	12,100	1.43×10^6	9,900	ASTM D2925
Shear Modulus	1.76×10^6	12,100	1.65×10^6	11,400	1.58×10^6	10,900	NOV FGS

Typical Physical Properties

Pipe Property	Value	Value	Method
Thermal Conductivity Pipe wall	0.19 BTU/hr•ft•°F	0.33 W/m°C	NOV FGS
Thermal Expansion	12.0×10^{-6} in/in/°F	21.6×10^{-6} mm/mm/°C	ASTM D696
Flow Coefficient, Hazen Williams	150		-
Absolute Roughness	1.7×10^6 ft	5.3×10^6 m	-
Density	121 lbs/ft^3	1940 kg/m^3	ASTM D792

[1] Value obtained at 150° F

[2] The differential pressure between internal and external pressure which causes collapse.

[3] A 0.67 design factor is recommended for short duration vacuum service. A full vacuum is equal to 14.7 psig (0.101 MPa) differential pressure at sea level.

[4] A 0.33 design factor is recommended for sustained (long-term) differential collapse pressure design and operation.

Ultimate Collapse Pressure

Size		Collapse Pressure[2,3,4]			
		psig		MPa	
In.	mm	75°F	200°F	24°C	93°C
2	50	150	125	1.03	0.86
3	80	150	125	1.03	0.86
4	100	65	50	0.45	0.34
6	150	65	50	0.45	0.34
8	200	65	50	0.45	0.34
10	250	65	50	0.45	0.34
12	300	65	50	0.45	0.34
14	350	65	50	0.45	0.34
16	400	65	50	0.45	0.34
18	450	65	50	0.45	0.34
20	550	65	50	0.45	0.34
24	600	65	50	0.45	0.34

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